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FINAL REPORT

The Population of Small Comets: Optimum Techniques for Detection

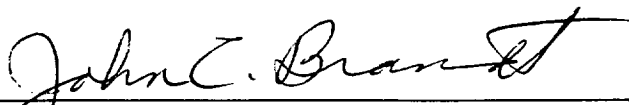
NGT5-4561

Preparation of the final report for this small grant was delayed until now for the following reasons:

- (1) There was a chance that we would receive ultraviolet images taken by the MSX Spacecraft and be able to run our algorithms on real images. Unfortunately, the MSX project experienced funding problems and no images have been received.
- (2) We were approached by a NASA representative about the possibility of carrying out an independent analysis of controversial data bearing on the existence of the house-sized objects proposed by L. Frank. We were approached because we had developed techniques in this area and because we had no direct stake in the controversy. The necessary agreements could not be reached by NASA with the observers. Hence, this possibility did not materialize.
- (3) We had expected our paper entitled "An Update on the Problem of Small Comets", presented in Kyoto, Japan to be published in Highlights in Astronomy from the August 1997 General Assembly. As explained in IAU Information Bulletin No. 83, January 1999, there have been considerable delays.

Thus, the overall status is basically the same as indicated in the Final Report for NAGW-4579, copy attached. We also attach a copy of the Final Report from M.F. A'Hearn for his subcontract from the University of Colorado.

We also note that the reference for our abstract entitled "The Lost Tribe of Small Comets (SCs)", by J. Brandt, C. Randall, I. Stewart, M. A'Hearn, Y. Fernandez, and D. Schleicher is *BAAS*, 29, p. 1260, 1997.



John C. Brandt, PI
January 19, 1999

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FINAL REPORT

The Population of Small Comets: Optimum Techniques for Detection

NAGW-4579

The goals of this project were: (1) to present evidence to the scientific community for the importance of the small comet population and (2) to develop techniques for optimum detection in order to characterize the population. The work has been carried out by D. Schleicher (Lowell Observatory), M. A'Hearn and Y. Fernandez (University of Maryland), I.A.F. Stewart, C. Randall, and J. Brandt (University of Colorado).

Publications are as follows:

- (1) Brandt, J.C., A'Hearn, M.F., Randall, C.E., Schleicher, D.G., Shoemaker, E.M., and Stewart, A.I.F., 1996, "On the Existence of Small Comets and their Interactions with Planets", *Earth, Moon, and Planets*, **72**, 243-249.
- (2) Brandt, J.C., A'Hearn, M.F., Randall, C.E., Schleicher, D.G., Shoemaker, E.M., and Stewart, A.I.F., 1997, "Small Comets (SCs): An Unstudied Population in the Solar System Inventory, in *Completing the Inventory of the Solar System*, ASP Conference Series, 107, T.W. Rettig and J.M. Hahn, eds., pp. 289-297.
- (3) Brandt, J.C., and A'Hearn, M.F., 1997, "An Update on the Problem of Small Comets", *Highlights in Astronomy*, from the August 1997 IAU General Assembly, Kyoto, Japan, in press.
- (4) Brandt, J., A'Hearn, M., Fernandez, Y., Randall, C., Schleicher, D., and Stewart, I., "The Lost Tribe of Small Comets", 1998, BAAS, in press, Abstract. (To be presented at the January 1998 AAS Meeting in Washington, DC).

Our work on techniques has been to develop algorithms for searching images for SCs based on the distinctive properties of comets: (1) motion with respect to background stars; (2) extended source with most light coming from the coma rather than the nucleus; and (3) characteristic spectral signature. Our work has been extended by a small grant (NGT 5-4561). This will enable us to complete the current stage of algorithm development and to apply the algorithms to ultraviolet images taken by the MSX Spacecraft if they become available in the near future.

John C. Brandt, PI
November 19, 1997

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